Use of General- and Special-Purpose Spectrum for Medical-Grade Communications

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Application-Dependent Requirements

Quality of Service (QoS) Requirements: With respect to a given application, the set of communication performance parameters and their corresponding values necessary for proper function.

Less Stringent More Stringent

E.g.:

- Throughput
- Latency....
- Packet loss rate

Communication Reliability: The degree of certainty that a given application's specific QoS requirements will be met.

The *Criticality* of application (risk) determines the required reliability.

A *Medical-Grade* solution for a given medical application must meet its specific QoS and reliability requirements.



A medical-grade solution for one medical application may not be medical-grade for another.

Less Critical



More Critica

Designing For Application Requirements Potential degrees of freedom:

Protocol:

- Modulation scheme
- Media access control (e.g., CSMA, TDMA, etc.)
- Error detection / correction schemes (e.g., CRC, FEC, ARQ)

Radio link:

- Transmit power
- Receiver performance (sensitivity, blocking, etc.)
- Path loss / infrastructure density
- RF environment and spectrum management

System design effort.

Elements in device design, deployment and use – often shared responsibilities.

Constraints:

- Cost
- Size
- Power / energy
- Complexity

Less Stringent







More Stringent



General-Purpose Communication Services

Unlicensed (Part 15)

- 802.11 Wi-Fi, Bluetooth, ZigBee, and many proprietary technologies
- LAN and PAN use-cases
- Many interference sources spectrum management increasingly challenging
- Reliable communications drive complexity and power consumption

Licensed (Parts 22, 24, 27, 90)

- 2.5G, 3G, 4G cellular technologies
- Wide-area use-cases (including indoor with DAS)
- Few interference sources / spectrum management concerns for user
- Powerful QoS potential, but typically limited by consumer-oriented coverage and capacity provisioning

Often shared, heterogeneous systems

E.g. Enterprise IT, Cellular networks

Reliability requires on-going system management by the enterprise with support from device / service providers (e.g. IEC 80001-1)



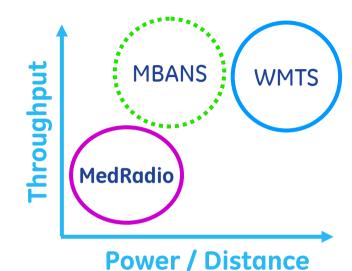
Special-Purpose Communication Services

- Wireless Medical Telemetry Service (WMTS)
 - LAN use-cases
 - Low to medium data rates
 - Limited, disjoint spectrum bands
 - Popular often used to capacity
- MedRadio Service (formerly MICS)
 - Implant / BAN use cases
 - Very limited spectrum
 - Very low data rates
 - Ultra low power
- Medical Body Area Networks Service (MBANS)
 - Currently-proposed allocation
 - BAN use cases
 - Low to medium data rates
 - Very low power

Fills

Unmet

Need



- Quiet bands with few and predictable interference
- Enable reliable communications for highly constrained devices.
- Complement each other and general-purpose services.

sources.



Thank You!

